

Panel dataset description for econometric analysis of the ISP-OTT relationship in the years 2008-2013

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Abstract

The latest technological advancements in the telecommunications domain (e.g., widespread adoption of mobile devices, introduction of 5G wireless communications, etc.) have brought new stakeholders into the spotlight. More specifically, Over-the-Top (OTT) providers have recently appeared, offering their services over the existing deployed telecommunication networks. The entry of the new players has changed the dynamics in the domain, as it creates conflicting situations with the Internet Service Providers (ISPs), who traditionally dominate the area, motivating the necessity for novel analytical studies for this relationship. However, despite the importance of accessing real observational data, there is no database with the aggregate information that can serve as a solid base for this research. To that end, this document provides a detailed summary report for financial and statistic data for the period 2008-2013 that can be exploited for realistic econometric models that will provide useful insights on this topic. The document summarizes data from various sources with regard to the ISP revenues and Capital Expenditures (CAPEX), the OTT revenues, the Internet penetration and the Gross Domestic Product (GDP), taking into account three big OTT providers (i.e., Facebook, Skype, WhatsApp) and ten major ISPs that operate in seven different countries.

Keywords: Network Neutrality; Internet; Over-the-Top; Internet Service Providers; Panel Data; Econometrics.

1. Introduction

The introduction of next generation wireless communications (i.e., 4G and 5G) along with the vast proliferation of handheld smart mobile devices have motivated the appearance

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of Over-the-Top (OTT) providers that offer their services over the existing telecommunications networks, operated mainly by the Internet Service Providers (ISPs). The conflicted interests among these entities (e.g., same customer base, similar services, use of the same network infrastructure, etc.) have triggered a series of discussions and interactions, aiming to clarify the boundaries of the formed relationships and the obligations of each party.

The aforementioned discussions have constituted the core of the network neutrality debate, which focuses on the Internet neutrality, i.e., the equal and fair treatment of all data, without any deliberate prioritization. Although there have been some important theoretical studies to analyze the relationship between OTT providers and ISPs [1, 2, 3, 4], empirical econometric researches could provide additional intriguing insights on the debate. However, econometric studies for this particular interaction were not possible until recently, as the main explosion of OTT services took place less than ten years ago and, hence, no data were available. Moreover, obtaining real data (regarding revenues, investments and costs) is often quite complicated due to privacy concerns of the involved companies.

In the light of the above context, this report provides a detailed summary of empirical data for several important variables (in the reference period 2008-2013) that affect the relationship between OTT companies and ISPs. More specifically, we have tried to collect data with regard to the i) ISP revenues, ii) Capital Expenditures (CAPEX) for the network investments of the ISPs, iii) OTT revenues, iv) Internet penetration, and v) real Gross Domestic Product (GDP) of different countries. Our data constitute a data panel and concern ten major ISPs and three huge OTT providers that operate in seven Organization for Economic Co-operation and Development (OECD) countries (Japan, USA, UK, France, Italy, Spain and Germany). It is worth noting that, for our study, we have referred to various sources and our main goal is to provide a compact document that summarizes data that can be exploited for empirical econometric studies. Although our data are, in most cases, accurate, in case of missing data we proceeded in some reasonable estimations through interpolation (taking into account the existing data) and a comparison with the available data gives errors lower than 20% (in particular, lower than 10% in the 95.45% of the cases and lower than 5% in the 77.27% of the cases). Moreover, in cases where specific data per country were not available (especially in case of OTT companies that operate worldwide), we resorted to some assumptions that provide a reasonable level of breakdown.

The remainder of this document is organized as follows. Section 2 provides the data regarding the ISP revenues and the CAPEX for the network investments. Section 3 provides the data for the OTT revenues. The Internet penetration and the GDP data are provided in Section 4 and 5, respectively. Finally, Section 6 concludes this report.

2. ISP revenues and CAPEX

Regarding the variables *ISP revenues* and *Capital Expenditures (CAPEX)*, our dataset refers to the following ten major ISPs, which have been identified as the most popular in

the seven countries of interest: i) NTT DoCoMo (Nippon Telegraph & Telephone), ii) Softbank, iii) AT & T, iv) Verizon, v) BT Group, vi) Vodafone, vii) Telecom Italia, viii) Orange (formerly France Tèlècom), ix) Telefónica, x) Deutsche Telecom.

Tables 1-10 illustrate the time series of *ISP revenues* and *Capital Expenditures* (in millions of US dollars) of each of the aforementioned ISP companies in the considered countries, over the reference period 2008-2013. In particular, the first column contains the year, the second includes the country where the company has generated its revenues and has invested *CAPEX*, which are presented in the third and in the fourth column, respectively, and, finally the fifth column illustrates the data sources¹ related to both time series of *ISP revenues* and *Capital Expenditures*. It is worth mentioning that the values of revenues and CAPEX generated by NTT DoCoMo, Softbank, BT Group, Vodafone, Telecom Italia, Orange, Telefónica and Deutsche Telecom have been converted into US dollars by employing the exchange rates acquired from [5].

Table 1: NTT DoCoMo revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	Japan	43022.208	7134.348	[6]
2009	Japan	45787.244	7336.682	[6]
2010	Japan	48133.829	7617.005	[6]
2011	Japan	53194.864	9118.810	[6]
2012	Japan	56006.741	9442.704	[6]
2013	Japan	45709.984	7204.287	[6]

Table 2: Softbank revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	Japan	25854.403	2506.036	[7]
2009	Japan	29532.403	2382.283	[8]
2010	Japan	34236.620	4792.459	[8]
2011	Japan	40177.600	6478.415	[8]
2012	Japan	40124.991	9436.452	[8]
2013	Japan	68307.250	12758.970	[8]

¹Please note that all references in this report have been accessed on July, 30th 2015.

Table 3: AT & T revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	USA	123443	19631	[9]
2009	USA	122513	16554	[10]
2010	USA	124280	19530	[10]
2011	USA	126723	20110	[10]
2012	USA	127434	19465	[10]
2013	USA	128752	20944	[10]

Table 4: Verizon revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	USA	97354	17133	[11]
2009	USA	107808	16872	[12]
2010	USA	106565	16458	[12]
2011	USA	110875	16244	[12]
2012	USA	115846	16175	[12]
2013	USA	120550	16604	[12]

Table 5: BT Group revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	UK	31476.190	5039.780	[13]
2009	UK	26109.204	3759.725	[13]
2010	UK	24828.439	3004.241	[13]
2011	UK	24959.936	3219.832	[14]
2012	UK	23400.951	3135.727	[14]
2013	UK	21978.125	2945.069	[14]

Table 6: Vodafone revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	UK	9934.066	1421.032	[15]
2009	UK	8411.856	1211.831	[15]
2010	UK	7766.615	1081.374	[15]
2011	UK	8447.115	1144.900	[16]
2012	UK	8553.090	1172.855	[16]
2013	UK	8046.875	1134.474	[16]
2008	Italy	8122.711	1161.924	[15]
2009	Italy	8653.666	1246.666	[15]
2010	Italy	9315.301	1297.004	[15]
2011	Italy	9169.872	1242.861	[16]
2012	Italy	8966.719	1229.575	[16]
2013	Italy	7429.688	1047.461	[16]
2008	Spain	9272.894	1326.454	[15]
2009	Spain	9067.083	1306.224	[15]
2010	Spain	8829.985	1229.431	[15]
2011	Spain	8225.962	1114.926	[16]
2012	Spain	7548.336	1035.077	[16]
2013	Spain	6100.000	859.998	[16]
2008	Germany	12575.092	1798.822	[15]
2009	Germany	12241.810	1763.582	[15]
2010	Germany	12377.125	1723.313	[15]
2011	Germany	12660.256	1715.939	[16]
2012	Germany	13047.544	1789.164	[16]
2013	Germany	12276.563	1730.790	[16]

Table 7: Orange revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	France	41812.865	6176.331	[17]
2009	France	32831.944	3775.674	[18]
2010	France	30871.523	3735.454	[19]
2011	France	31293.463	3974.270	[20]
2012	France	27506.427	3685.861	[21]
2013	France	26586.985	3758.300	[22]
2008	Spain	4970.760	734.249	[17]
2009	Spain	5398.611	620.840	[18]
2010	Spain	5060.927	612.372	[19]
2011	Spain	5549.374	704.771	[20]
2012	Spain	5141.388	688.946	[21]
2013	Spain	5378.486	746.348	[22]

Table 8: Telecom Italia revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	Italy	33957.602	5347.953	[23]
2009	Italy	30087.500	4881.944	[24]
2010	Italy	26580.132	4113.907	[25]
2011	Italy	26413.074	5820.584	[26]
2012	Italy	22987.147	3948.586	[27]
2013	Italy	21480.744	4019.920	[27]

Table 9: Telefónica revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	UK	10309.942	1048.246	[28]
2009	UK	9044.444	836.111	[28]
2010	UK	9537.748	949.669	[29]
2011	UK	9632.823	1018.081	[30]
2012	UK	9051.414	961.440	[30]
2013	UK	8887.118	1839.309	[30]
2008	Spain	30464.912	3228.070	[28]
2009	Spain	27365.278	2587.500	[28]
2010	Spain	24782.781	2676.821	[29]
2011	Spain	24029.207	4050.070	[30]
2012	Spain	19275.064	2174.807	[30]
2013	Spain	17209.827	2030.544	[30]
2008	Germany	5255.848	1350.877	[28]
2009	Germany	5202.778	1105.556	[28]
2010	Germany	6392.053	2724.503	[29]
2011	Germany	7002.782	776.078	[30]
2012	Germany	6700.514	782.776	[30]
2013	Germany	6525.896	884.462	[30]

Table 10: Deutsche Telecom revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX	Reference
2008	USA	21866.959	3713.450	[31]
2009	USA	21487.500	3702.778	[31]
2010	USA	21307.285	2809.272	[31]
2011	USA	20599.444	2730.181	[32]
2012	USA	19757.069	3290.488	[32]
2013	USA	24642.762	4354.582	[32]
2008	Germany	38596.491	4441.520	[31]
2009	Germany	35309.722	4386.111	[31]
2010	Germany	33304.636	6311.258	[31]

2011	Germany	32275.382	4876.217	[32]
2012	Germany	29223.650	4393.316	[32]
2013	Germany	29794.157	4529.880	[32]

Finally, Table 11 illustrates the aggregate series of *ISP revenues* and *CAPEX* (in millions of US dollars) in the considered countries, over the reference period 2008-2013, obtained by summing the *ISP revenues* and *Capital Expenditures* available for every single ISP company.

Table 11: ISP revenues and CAPEX (in millions of US dollars)

Year	Country	Annual revenues	CAPEX
2008	Japan	68876.61	9640.38
2009	Japan	75319.65	9718.97
2010	Japan	82370.45	12409.46
2011	Japan	93372.46	15597.22
2012	Japan	96131.73	18879.16
2013	Japan	114017.23	19963.26
2008	USA	242663.96	40477.45
2009	USA	251808.50	37128.78
2010	USA	252152.28	38797.27
2011	USA	258197.44	39084.18
2012	USA	263037.07	38930.49
2013	USA	273944.76	41902.58
2008	UK	51720.20	7509.06
2009	UK	43565.51	5807.67
2010	UK	42132.80	5035.28
2011	UK	43039.87	5382.81
2012	UK	41005.46	5270.02
2013	UK	38912.12	5918.85
2008	France	41812.87	6176.33
2009	France	32831.94	3775.67
2010	France	30871.52	3735.45
2011	France	31293.46	3974.27
2012	France	27506.43	3685.86

2013	France	26586.99	3758.30
2008	Italy	42080.31	6509.88
2009	Italy	38741.17	6128.61
2010	Italy	35895.43	5410.91
2011	Italy	35582.95	7063.45
2012	Italy	31953.87	5178.16
2013	Italy	28910.43	5067.38
2008	Spain	44708.57	5288.77
2009	Spain	41830.97	4514.56
2010	Spain	38673.69	4518.62
2011	Spain	37804.54	5869.77
2012	Spain	31964.79	3898.83
2013	Spain	28688.31	3636.89
2008	Germany	56427.43	7591.22
2009	Germany	52754.31	7255.25
2010	Germany	52073.81	10759.07
2011	Germany	51938.42	7368.23
2012	Germany	48971.71	6965.26
2013	Germany	48596.62	7145.13

3. OTT revenues

Among the numerous OTT suppliers at play, our dataset focuses on the most popular ones, who offer similar services (e.g., voice and instant messaging) to those of the ISPs: i) Skype, ii) Facebook, iii) Whatsapp. Therefore, the *OTT revenues* refer to the revenues generated by the three aforementioned OTT providers in the considered countries over the reference period 2008-2013.

3.1. Skype

As the Skype revenues per country are not available, a rough estimation which employs the *Skype total users*, the *Skype users by country* and the *Skype total revenues* has been made.

Table 12 illustrates the *Skype total users* over the reference period 2008-2013. In particular, the first column contains the year, the second column includes the number of *Skype total users* in millions of people, while the third one illustrates the sources from which data has been obtained.

Table 12: Skype total users (in millions of people)

Year	Users	Reference
2008	75	[33]
2009	105	[33]
2010	145	[33]
2011	200	[34]
2012	280	[35]
2013	300	[36]

Table 13 illustrates the *Skype users by country*. Specifically, the first and the second columns contain the reference year and country, respectively, while the third and the fourth columns illustrate the country smartphone penetration rate, a proxy of the Skype penetration rate by country, based on the assumption that smartphone users are also Skype users, and the reference from which the data have been acquired. It is worth mentioning that due to the absence of available data for 2008 and 2009, the corresponding values (in red) in Table 13 have been obtained by interpolation², while the blue values in the table correspond to forecasts made by [37].

Table 13: Skype users by country

Year	Country	Users	Reference
2008	Japan	0.007	-
2009	Japan	0.021	-
2010	Japan	0.065	[37]
2011	Japan	0.180	[37]
2012	Japan	0.330	[37]
2013	Japan	0.490	[37]
2008	USA	0.093	-
2009	USA	0.188	-
2010	USA	0.269	[37]
2011	USA	0.392	[37]
2012	USA	0.477	[37]
2013	USA	0.555	[37]

²A comparison with the available data gives errors lower than 20% (in particular, lower than 10% in the 95.45% of the cases and lower than 5% in the 77.27% of the cases).

2008	UK	0.003	-
2009	UK	0.106	-
2010	UK	0.200	[37]
2011	UK	0.300	[37]
2012	UK	0.368	[37]
2013	UK	0.455	[37]
2008	France	0.099	-
2009	France	0.124	-
2010	France	0.170	[37]
2011	France	0.245	[37]
2012	France	0.330	[37]
2013	France	0.450	[37]
2008	Italy	0.007	-
2009	Italy	0.072	-
2010	Italy	0.130	[37]
2011	Italy	0.240	[37]
2012	Italy	0.314	[37]
2013	Italy	0.410	[37]
2008	Spain	0.039	-
2009	Spain	0.077	-
2010	Spain	0.130	[37]
2011	Spain	0.200	[37]
2012	Spain	0.280	[37]
2013	Spain	0.380	[37]
2008	Germany	0.003	-
2009	Germany	0.049	-
2010	Germany	0.100	[37]
2011	Germany	0.185	[37]
2012	Germany	0.270	[37]
2013	Germany	0.360	[37]

Table 14 illustrates the *Skype total revenues*. Specifically, the first column contains the reference year, while the second and the third columns illustrate the total annual revenues, and the reference from which the data have been acquired. Due to the absence of available data about the Skype annual revenues in 2012, the respective value (in red) has been obtained by interpolation, while, regarding the year 2011, the value in blue corresponds to an estimation made by [38].

Table 14: Skype total revenues (in millions of US dollars)

Year	Annual revenues	Reference
2008	551.36	[39]
2009	718.90	[39]
2010	859.82	[39]
2011	1000.00	[38]
2012	1478.33	-
2013	2000.00	[40]

Finally, Table 15 illustrates the *Skype revenues by country*. In particular, the first and the second columns contain the reference year and country, respectively, while the third one illustrates the total annual revenues by country approximated by the following formula:

$$Skype\ revenues\ by\ country \approx \frac{Skype\ total\ revenues * Skype\ users\ by\ country}{Skype\ total\ users}. \quad (1)$$

Table 15: Skype revenues by country (in millions of US dollars)

Year	Country	Annual revenues
2008	Japan	0.051
2009	Japan	0.146
2010	Japan	0.385
2011	Japan	0.900
2012	Japan	1.742
2013	Japan	3.267
2008	USA	0.685
2009	USA	1.284
2010	USA	1.595
2011	USA	1.960
2012	USA	2.518

2013	USA	3.700
2008	UK	0.025
2009	UK	0.727
2010	UK	1.186
2011	UK	1.500
2012	UK	1.943
2013	UK	3.033
2008	France	0.726
2009	France	0.847
2010	France	1.008
2011	France	1.225
2012	France	1.742
2013	France	3.000
2008	Italy	0.053
2009	Italy	0.490
2010	Italy	0.771
2011	Italy	1.200
2012	Italy	1.658
2013	Italy	2.733
2008	Spain	0.290
2009	Spain	0.531
2010	Spain	0.771
2011	Spain	1.000
2012	Spain	1.478
2013	Spain	2.533
2008	Germany	0.023
2009	Germany	0.336
2010	Germany	0.593
2011	Germany	0.925
2012	Germany	1.426
2013	Germany	2.400

3.2. Facebook

As the Facebook revenue per country is not available for each of the considered countries, in the absence of data, a rough estimation which employs the *Facebook total users*, the *Facebook users by country* and the *Facebook total revenues* has been made.

Table 16 illustrates the *Facebook total users* over the reference period 2008-2013. In particular, the first column contains the year, the second includes the number of *Facebook total users* (in millions of people), while the third one illustrates the sources from which data have been obtained.

Table 16: Facebook total users (in millions of people)

Year	Users	Reference
2008	145	[41]
2009	360	[41]
2010	608	[41]
2011	845	[41]
2012	1056	[41]
2013	1230	[41]

Table 17 illustrates the *Facebook users by country*. Specifically, the first and the second columns contain the reference year and country, respectively, while the third and the fourth columns illustrate the number of *Facebook users by country* and the reference from which the data have been acquired. As it is possible to notice by Table 17, there is no value related to Facebook users in Japan in 2008. This is due to the fact that the Japanese version of Facebook has been launched in 2008 [42, 43], therefore there are no available data before 2009. Moreover, it is worth mentioning that due to the absence of available data about UK Facebook users in 2010, the respective value (in red) in Table 17 has been obtained by interpolation, while the blue values correspond to adjustments made by interpolation in the case in which the collected values were related to the months of July and September and not to the end of the year such as all the other values.

Table 17: Facebook users by country (in millions of people)

Year	Country	Users	Reference
2008	Japan	-	-
2009	Japan	1.00	[44]
2010	Japan	6.00	[45]
2011	Japan	13.50	[45]
2012	Japan	23.20	[46]
2013	Japan	25.30	[46]
2008	USA	33.00	[47]
2009	USA	103.00	[48]

2010	USA	138.60	[49]
2011	USA	149.40	[50]
2012	USA	169.00	[51]
2013	USA	180.00	[52]
2008	UK	12.00	[53]
2009	UK	18.46	[54]
2010	UK	23.41	-
2011	UK	25.60	[55]
2012	UK	28.30	[55]
2013	UK	29.90	[55]
2008	France	6.54	[56]
2009	France	14.45	[54]
2010	France	22.00	[57]
2011	France	23.00	[58]
2012	France	25.62	[59]
2013	France	26.00	[60]
2008	Italy	4.90	[61]
2009	Italy	12.71	[54]
2010	Italy	18.19	[54]
2011	Italy	21.70	[62]
2012	Italy	23.20	[59]
2013	Italy	23.00	[60]
2008	Spain	2.30	[63]
2009	Spain	11.50	[64]
2010	Spain	15.00	[64]
2011	Spain	16.00	[65]
2012	Spain	17.59	[59]
2013	Spain	18.00	[60]
2008	Germany	1.20	[66]
2009	Germany	9.48	[54]
2010	Germany	18.00	[67]
2011	Germany	22.00	[58]
2012	Germany	25.33	[59]
2013	Germany	25.00	[60]

Table 18 illustrates the *Facebook total revenues*. Specifically, the first column contains the reference year, while the second and the third columns illustrate the total annual revenues and the reference from which the data have been acquired, namely the company’s reports.

Table 18: Facebook total revenues (in millions of US dollars)

Year	Annual revenues	Reference
2008	272	[68]
2009	777	[69]
2010	1974	[69]
2011	3711	[69]
2012	5089	[69]
2013	7872	[69]

Finally, Table 19 illustrates the *Facebook revenues by country*. In particular, the first and the second columns contain the reference year and country, respectively, while the third one illustrates the total annual revenues by country approximated by the following formula:

$$Facebook\ revenues\ by\ country \approx \frac{Facebook\ total\ revenues * Facebook\ users\ by\ country}{Facebook\ total\ users}. \quad (2)$$

In the specific case of the USA, the available Facebook revenues generated in the USA have been collected from the references reported in the fourth column of Table 19. However, due to the absence of available data for the years 2008 and 2009, the related values, represented in red in Table 19, have been obtained by interpolation.

Table 19: Facebook revenues by country (in millions of US dollars)

Year	Country	Annual revenues	Reference
2008	Japan	-	
2009	Japan	2.16	
2010	Japan	19.48	
2011	Japan	59.29	
2012	Japan	111.80	
2013	Japan	161.92	
2008	USA	207.15	-

2009	USA	688.75	-
2010	USA	1223.00	[68]
2011	USA	2067.00	[69]
2012	USA	2578.00	[69]
2013	USA	3613.00	[69]
2008	UK	22.51	
2009	UK	39.85	
2010	UK	76.01	
2011	UK	112.43	
2012	UK	136.38	
2013	UK	191.36	
2008	France	12.27	
2009	France	31.19	
2010	France	71.43	
2011	France	101.01	
2012	France	123.47	
2013	France	166.40	
2008	Italy	9.19	
2009	Italy	27.43	
2010	Italy	59.06	
2011	Italy	95.30	
2012	Italy	111.80	
2013	Italy	147.20	
2008	Spain	4.31	
2009	Spain	24.82	
2010	Spain	48.70	
2011	Spain	70.27	
2012	Spain	84.77	
2013	Spain	115.20	
2008	Germany	2.25	
2009	Germany	20.46	
2010	Germany	58.44	
2011	Germany	96.62	
2012	Germany	122.07	
2013	Germany	160.00	

3.3. WhatsApp

Similarly to Skype, as the WhatsApp revenue per country is not available, a rough estimation which employs the *WhatsApp total users*, the *WhatsApp users by country* and the *WhatsApp total revenues* has been made.

Table 20 illustrates the *WhatsApp total users* over the reference period 2008-2013. In particular, the first column contains the year, the second includes the number of *WhatsApp total users* in millions of people, while the third one illustrates the sources from which data has been obtained. As it can be noticed in Table 20, there is no value related to WhatsApp users in 2008. This is due to the fact that WhatsApp has been established in 2009 [70, 71]. Moreover, due to the absence of available data for the year 2011, the related value, represented in red in Table 20, has been obtained by interpolation.

Table 20: WhatsApp total users (in millions of people)

Year	Users	Reference
2008	-	-
2009	1.00	[72]
2010	10.00	[72]
2011	106.50	-
2012	250.00	[73]
2013	400.00	[74]

Table 21 illustrates the *WhatsApp users by country*. Specifically, the first and the second columns contain the reference year and country, respectively, while the third and the fourth columns illustrate the country smartphone penetration rate, a proxy of the WhatsApp penetration rate by country, based on the assumption that smartphone users are also WhatsApp users, and the reference from which the data have been acquired. It is worth mentioning that due to the absence of available data for 2008 and 2009, the related values, represented in red in Table 21, have been obtained by interpolation, while the blue values in the table correspond to forecasts made by [37].

Table 21: WhatsApp users by country

Year	Country	Users	Reference
2008	Japan	-	-
2009	Japan	0.021	-
2010	Japan	0.065	[37]
2011	Japan	0.180	[37]
2012	Japan	0.330	[37]

2013	Japan	0.490	[37]
2008	USA	-	-
2009	USA	0.188	-
2010	USA	0.269	[37]
2011	USA	0.392	[37]
2012	USA	0.477	[37]
2013	USA	0.555	[37]
2008	UK	-	-
2009	UK	0.106	-
2010	UK	0.200	[37]
2011	UK	0.300	[37]
2012	UK	0.368	[37]
2013	UK	0.455	[37]
2008	France	-	-
2009	France	0.124	-
2010	France	0.170	[37]
2011	France	0.245	[37]
2012	France	0.330	[37]
2013	France	0.450	[37]
2008	Italy	-	-
2009	Italy	0.072	-
2010	Italy	0.130	[37]
2011	Italy	0.240	[37]
2012	Italy	0.314	[37]
2013	Italy	0.410	[37]
2008	Spain	-	-
2009	Spain	0.077	-
2010	Spain	0.130	[37]
2011	Spain	0.200	[37]
2012	Spain	0.280	[37]
2013	Spain	0.380	[37]
2008	Germany	-	-
2009	Germany	0.049	-
2010	Germany	0.100	[37]
2011	Germany	0.185	[37]
2012	Germany	0.270	[37]
2013	Germany	0.360	[37]

Table 22 illustrates the *WhatsApp total revenues*. Specifically, the first column contains the reference year, while the second and the third columns illustrate the total annual revenues and the reference from which the data have been acquired. Due to the absence of available data about the WhatsApp annual revenues in 2009, 2010 and 2011, the related values (in red) have been obtained by interpolation.

Table 22: WhatsApp total revenues (in millions of US dollars)

Year	Annual revenues	Reference
2008	-	-
2009	0.000037	-
2010	0.004549	-
2011	0.641049	-
2012	3.820000	[75]
2013	10.210000	[75]

Finally, Table 23 illustrates the WhatsApp revenues by country. In particular, the first and the second columns contain the reference year and country, respectively, while the third one illustrate the total annual revenues by country approximated by the following formula:

$$WhatsApp \text{ revenues by country} \approx \frac{WhatsApp \text{ total revenues} * WhatsApp \text{ users by country}}{WhatsApp \text{ total users}} \quad (3)$$

Table 23: WhatsApp revenues by country (in millions of US dollars)

Year	Country	Annual revenues
2008	Japan	-
2009	Japan	0.000001
2010	Japan	0.000030
2011	Japan	0.001083
2012	Japan	0.005042
2013	Japan	0.012507
2008	USA	-
2009	USA	0.000007
2010	USA	0.000122

2011	USA	0.002360
2012	USA	0.007289
2013	USA	0.014166
2008	UK	-
2009	UK	0.000004
2010	UK	0.000091
2011	UK	0.001806
2012	UK	0.005623
2013	UK	0.011614
2008	France	-
2009	France	0.000005
2010	France	0.000077
2011	France	0.001475
2012	France	0.005042
2013	France	0.011486
2008	Italy	-
2009	Italy	0.000003
2010	Italy	0.000059
2011	Italy	0.001445
2012	Italy	0.004798
2013	Italy	0.010465
2008	Spain	-
2009	Spain	0,000003
2010	Spain	0,000059
2011	Spain	0,001204
2012	Spain	0,004278
2013	Spain	0,009700
2008	Germany	-
2009	Germany	0.000002
2010	Germany	0.000045
2011	Germany	0.001114
2012	Germany	0.004126
2013	Germany	0.009189

3.4. *OTT revenues: the aggregate variable*

With regard to the aggregate variable *OTT revenues*, Table 24 illustrates the time series of *OTT revenues* in millions of US dollars in the considered countries, over the reference

period 2008-2013, obtained by summing the *OTT revenues* determined for every single OTT company.

Table 24: OTT revenues (in millions of US dollars)

Year	Country	Annual revenues
2008	Japan	0.05
2009	Japan	2.30
2010	Japan	19.87
2011	Japan	60.19
2012	Japan	113.55
2013	Japan	165.20
2008	USA	207.84
2009	USA	690.03
2010	USA	1224.60
2011	USA	2068.96
2012	USA	2580.53
2013	USA	3616.70
2008	UK	22.53
2009	UK	40.57
2010	UK	77.20
2011	UK	113.93
2012	UK	138.33
2013	UK	194.40
2008	France	12.99
2009	France	32.04
2010	France	72.44
2011	France	102.24
2012	France	125.21
2013	France	169.41
2008	Italy	9.24
2009	Italy	27.92
2010	Italy	59.83
2011	Italy	96.50
2012	Italy	113.47
2013	Italy	149.94
2008	Spain	4.60

2009	Spain	25.35
2010	Spain	49.47
2011	Spain	71.27
2012	Spain	86.25
2013	Spain	117.74
2008	Germany	2.27
2009	Germany	20.80
2010	Germany	59.03
2011	Germany	97.54
2012	Germany	123.50
2013	Germany	162.41

4. Internet penetration

With regard to the *Internet Penetration*, firstly, the time series called “*Internet users (per 100 people)*” (last updated date 01.07.2015) has been obtained from [76]. According to the description of the data (available in [76]), the latter consists of the Internet users, i.e., the number of people by country with access to the worldwide network, per 100 people. Therefore, in order to obtain the time series of the *Total Internet users* by country, the time series of the *Total Population* in the considered countries has been employed. In particular, the time series called “*Total Population (in number of people)*”(last updated date 01.07.2015) has been acquired from [77] and, in order to express the *Internet users (per 100 people)* in terms of *Total Internet users*, the unknown of the following proportion has been determined:

$$Internet\ users\ (per\ 100\ people) : 100 = x : Total\ Population\ (in\ number\ of\ people), \quad (4)$$

where x is the variable *Total Internet users*. Moreover, the series of *Total Internet users* resulting from (4) has been divided by 1 million in order to make it consistent with all the other variables of the dataset, which are expressed in millions. Table 25 illustrates the time series of the *Internet Penetration*, i.e., the *Total Internet users* (in millions of people) in the considered countries, over the reference period 2008-2013.

Table 25: Internet penetration (in millions of people)

Year	Country	Internet penetration
2008	Japan	96.56
2009	Japan	99.88
2010	Japan	100.16
2011	Japan	101.04
2012	Japan	110.02
2013	Japan	109.83
2008	USA	225.03
2009	USA	217.81
2010	USA	221.77
2011	USA	217.36
2012	USA	249.09
2013	USA	266.49
2008	UK	48.45
2009	UK	52.04
2010	UK	53.35
2011	UK	54.01
2012	UK	55.73
2013	UK	57.60
2008	France	45.50
2009	France	46.31
2010	France	50.25
2011	France	50.85
2012	France	53.45
2013	France	54.00
2008	Italy	26.20
2009	Italy	28.86
2010	Italy	31.82
2011	Italy	32.30
2012	Italy	33.24
2013	Italy	35.21
2008	Spain	27.39
2009	Spain	28.93
2010	Spain	30.65
2011	Spain	31.60

2012	Spain	32.65
2013	Spain	33.37
2008	Germany	64.05
2009	Germany	64.70
2010	Germany	67.06
2011	Germany	66.48
2012	Germany	66.23
2013	Germany	67.71

5. GDP

Regarding the *Gross Domestic Product (GDP)*, firstly, the time series called “GDP (current \$)” (last updated date 28.07.2015) has been obtained from [78]. According to the description of the data (available in [78]), the latter is expressed in nominal terms, since the GDP is expressed in current US dollars. Therefore, the downloaded variable has been made real by employing the *Consumer Price Index (CPI)*. In particular, the time series called “*Consumer price index (2010 = 100)*”(last updated date 29.07.2015) has been acquired from [79] and, in order to express the nominal *GDP* in real terms, the time series of nominal GDP has been divided by the time series of *CPI*:

$$real\ GDP = \frac{nominal\ GDP}{CPI}. \quad (5)$$

Moreover, the series of real *GDP* resulting from (5) has been divided by 1 million in order to make it consistent with all the other variables of the dataset, which are expressed in millions. Table 26 illustrates the time series of real *GDP* in millions of US dollars in the considered countries, over the reference period 2008-2013.

Table 26: Real GDP (in millions of US dollars)

Year	Country	Real GDP
2008	Japan	47494.46
2009	Japan	49986.51
2010	Japan	54953.86
2011	Japan	59222.15
2012	Japan	59735.92
2013	Japan	49175.96

2008	USA	149064.03
2009	USA	146546.79
2010	USA	149643.72
2011	USA	150425.80
2012	USA	153510.86
2013	USA	156960.15
2008	UK	29457.44
2009	UK	23848.33
2010	UK	24078.57
2011	UK	24808.73
2012	UK	24340.93
2013	UK	24307.26
2008	France	29707.00
2009	France	27351.28
2010	France	26469.95
2011	France	28030.77
2012	France	25755.61
2013	France	26761.73
2008	Italy	24469.31
2009	Italy	22199.83
2010	Italy	21267.48
2011	Italy	22173.34
2012	Italy	19601.60
2013	Italy	19941.66
2008	Spain	16595.50
2009	Spain	15260.86
2010	Spain	14316.73
2011	Spain	14481.64
2012	Spain	12823.80
2013	Spain	12993.57
2008	Germany	38001.18
2009	Germany	34505.87
2010	Germany	34122.12
2011	Germany	36754.28
2012	Germany	33931.07
2013	Germany	35294.36

6. Conclusion

In this report, we provided a summary for observational and estimated data regarding important variables (i.e., ISP revenues, CAPEX, OTT revenues, Internet penetration and GDP) that can be exploited for empirical econometric studies on the relationship between ISPs and OTT providers. Our data constitute a balanced panel of ten major ISPs and three popular OTT providers that provide their services in seven OECD countries for the period 2008-2013. In our future work, we plan to update and extend this dataset taking into account more companies (both ISPs and OTT providers) and countries.

References

- [1] R. T. Ma, J. Lui, and V. Misra, “Evolution of the internet economic ecosystem,” *IEEE/ACM Transactions on Networking (TON)*, vol. 23, no. 1, pp. 85–98, 2015.
- [2] P. Coucheney, P. Maillé, and B. Tuffin, “Impact of competition between isps on the net neutrality debate,” *IEEE Transactions on Network and Service Management*, vol. 10, no. 4, pp. 425–433, 2013.
- [3] D. Saucez, S. Secci, and C. Barakat, “On the incentives and incremental deployments of icn technologies for ott services,” *IEEE Network*, vol. 28, no. 3, pp. 20–25, 2014.
- [4] C. Courcoubetis, K. Sdrolas, and R. Weber, “Revenue models, price differentiation and network neutrality implications in the internet,” *ACM SIGMETRICS Performance Evaluation Review*, vol. 41, no. 4, pp. 20–23, 2014.
- [5] The World Bank, “Monthly Monetary and Financial Statistics (MEI): Exchange rates (USD monthly averages).” <http://stats.oecd.org/index.aspx?DatasetCode=MEI.FIN>. [Online; Data extracted on 13.02.2015].
- [6] NTT DoCoMo, “NTT DoCoMo annual report 2014.” https://www.nttdocomo.co.jp/english/corporate/ir/binary/pdf/library/annual/fy2013/docomo_ar2014_e.pdf, 2015. [Online].
- [7] Softbank, “Softbank annual report 2013.” http://cdn.softbank.jp/en/corp/set/data/irinfo/financials/annual_reports/pdf/2013/softbank_annual_report_2013_001.pdf, 2014. [Online].
- [8] Softbank, “Softbank annual report 2014.” http://cdn.softbank.jp/en/corp/set/data/irinfo/financials/annual_reports/pdf/2014/softbank_annual_report_2014_001.pdf, 2015. [Online].

- [9] AT & T, “At & T annual report 2010.” http://www.att.com/Common/about_us/annual_report/pdfs/ATT2010_Full.pdf, 2011. [Online].
- [10] AT & T, “At & T annual report 2013.” http://www.att.com/Investor/ATT_Annual/2013/downloads/ar2013_annual_report.pdf, 2014. [Online].
- [11] Verizon, “Verizon annual report 2010.” <http://www.verizon.com/about/investors/annual-report>, 2011. [Online].
- [12] Verizon, “Verizon annual report 2013.” <http://www.verizon.com/about/investors/annual-report>, 2014. [Online].
- [13] BTGroup, “Verizon annual report 2010.” <https://www.btplc.com/Sharesandperformance/Annualreportandreview/pdf/BTGroupAnnualReport2010.pdf>, 2011. [Online].
- [14] BTGroup, “Verizon annual report 2013.” http://www.btplc.com/Sharesandperformance/Annualreportandreview/pdf/2013_BT_Annual_Report_smart.pdf, 2014. [Online].
- [15] Vodafone, “Vodafone annual report 2010.” http://www.vodafone.com/content/dam/vodafone/investors/annual_reports/annual_report_accounts_2010.pdf, 2011. [Online].
- [16] Vodafone, “Vodafone annual report 2013.” http://www.vodafone.com/content/annualreport/annual_report13/downloads/vodafone_annual_report_2013.pdf, 2014. [Online].
- [17] Orange, “Orange annual report 2008.” <http://www.orange.com/en/content/download/4570/65453/version/2/file/annual-report2008.en.pdf>, 2009. [Online].
- [18] Orange, “Orange annual report 2009.” http://www.orange.com/en/content/download/4572/65461/version/2/file/FTEL_1005297_complet_GB.indd_RVB.pdf, 2010. [Online].
- [19] Orange, “Orange annual report 2010.” <http://www.orange.com/en/content/download/4548/65268/version/3/file/2010annualreport.pdf>, 2011. [Online].
- [20] Orange, “Orange annual report 2011.” http://www.orange.com/en/content/download/6366/93028/version/3/file/RA2011_EN.pdf, 2012. [Online].
- [21] Orange, “Orange annual report 2012.” <http://www.orange.com/en/content/download/12910/269508/version/2/file/Orange-RA-2012-GB.pdf>, 2013. [Online].

- [22] Orange, “Orange annual report 2013.” http://www.orange.com/en/content/download/23308/480043/version/2/file/the_little_Orange_book.pdf, 2014. [Online].
- [23] Telecom Italia, “Telecom Italia annual report 2009.” https://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports2009/2009Annual_Report.pdf, 2010. [Online].
- [24] Telecom Italia, “Telecom Italia annual report 2010.” http://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports/2010/AnnualReport2010.pdf, 2011. [Online].
- [25] Telecom Italia, “Telecom Italia annual report 2011.” http://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports/2011/TelecomItaliaGroupAnnualReport2011.pdf, 2012. [Online].
- [26] Telecom Italia, “Telecom Italia annual report 2012.” http://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports/2012/AnnualReport2012.pdf, 2013. [Online].
- [27] Telecom Italia, “Telecom Italia annual report 2013.” http://www.telecomitalia.com/content/dam/telecomitalia/en/archive/documents/investors/Annual_Reports/2013/Annual-Report-2013.pdf, 2014. [Online].
- [28] Telefónica, “Telefónica annual report 2009.” http://www.telefonica.com/en/about_telefonica/pdf/informes/2009/Telefonica_IA09_Ing.pdf, 2010. [Online].
- [29] Telefónica, “Telefónica annual report 2010.” http://www.telefonica.com/en/about_telefonica/pdf/informes/2010/telefonica_ia10_eng.pdf, 2011. [Online].
- [30] Telefónica, “Telefónica annual report 2013.” http://www.telefonica.com/en/shareholders-investors/pdf/20140320_Consolidated_Annual_Accounts_311213.pdf, 2014. [Online].
- [31] Deutsche Telekom, “Deutsche Telekom annual report 2010.” <http://www.telekom.com/investor-relations/publications/Financial-results/205540>, 2011. [Online].
- [32] Deutsche Telekom, “Deutsche Telekom annual report 2013.” <http://www.telekom.com/ar-2013>, 2014. [Online].
- [33] G. Fujimoto, “Marketing I Skype HOMEpage.” <http://www.slideshare.net/goc1126/skype-marketing-final-28623964>, 2013. [Online; published on 25.11.2013].

- [34] J. Mercier, “Skype Numerology.” <http://skypenumerology.blogspot.ch/2012/01/skype-calling-minutes-in-2011.html>, 2012. [Online; published on 19.01.2012].
- [35] M. A. Athanasios Paraskelidis and M. T. P. M. Dewage, “Evaluating the Energy Efficiency of Modern VoIP Applications.” <http://www.atiner.gr/papers/COM2013-0787.pdf>, 2013. [Online; published on 20.12.2013].
- [36] T. Warren, “Viber messaging app acquired by Japan’s Rakuten for \$ 900 million.” <http://www.theverge.com/2014/2/14/5411082/viber-messaging-app-acquired-by-rakuten>, 2014. [Online; published on 14.02.2014].
- [37] eMarketer, “Three Out of Four UK Mobile Users to Own Smartphones by 2016.” <http://www.emarketer.com/Article/Three-of-Four-UK-Mobile-Users-Own-Smartphones-by-2016/1009614>, 2013. [Online; published on 18.01.2013].
- [38] O. Furrer, *Corporate level strategy: Theory and applications*. Routledge, 2016.
- [39] Statista, “Skype’s annual revenue from 2006 to 2010 (in million U.S. dollars).” <https://www.statista.com/statistics/266191/skype-revenue-since-2006/>, 2016.
- [40] D. Bass, “Microsoft Skype Unit Approaching \$2 Billion in Annual Sales.” <https://www.bloomberg.com/news/articles/2013-02-19/microsoft-s-skype-unit-approaching-2-billion-in-annual-revenue>, 2013. [Online; published on 19.02.2013].
- [41] A. Sedghi, “Facebook: 10 years of social networking, in numbers.” <https://www.theguardian.com/news/datablog/2014/feb/04/facebook-in-numbers-statistics>, 2014. [Online; published on 04.02.2014].
- [42] H. Tabuchi, “Facebook Wins Relatively Few Friends in Japan.” <http://www.nytimes.com/2011/01/10/technology/10facebook.html>, 2011. [Online; published on 09.01.2011].
- [43] M. Hamada, “A facebook project for japanese university students: Does it really enhance student interaction, learner autonomy, and english abilities?,” in *EUROCALL Conference*, p. 104, 2012.
- [44] B. Darwell, “Facebook reaches 10M in Japan, doubles users in 6 months.” <http://www.adweek.com/socialtimes/facebook-reaches-10m-in-japan-doubled-users-in-6-months/276511>, 2012. [Online; published on 16.03.2012].
- [45] Bloomberg, “In Japan Facebook wins the most users.” <http://www.bloomberg.com/news/articles/2012-03-22/in-japan-facebook-wins-the-most-users>, 2012. [Online; published on 22.03.2012].

- [46] Statista, “Number of Facebook users in Japan.” <https://www.statista.com/statistics/304831/number-of-facebook-users-in-japan/>, 2014.
- [47] SocialTimes, “Latest Data on US Facebook Age and Gender Demographics.” <http://www.adweek.com/socialtimes/latest-data-on-us-facebook-age-and-gender-demographics/213798>, 2008. [Online; published on 18.09.2008].
- [48] SocialTimes, “December Data on Facebook’s US Growth by Age and Gender: Beyond 100 Million.” <http://www.adweek.com/socialtimes/december-data-on-facebook%E2%80%99s-us-growth-by-age-and-gender-beyond-100-million/233478>, 2010. [Online; published on 04.01.2010].
- [49] E. Eldon, “Facebook US Demographic Data for September 2010: Nearly 5 Million More Users.” <http://www.adweek.com/socialtimes/facebook-us-demographic-data-for-september-2010-nearly-5-million-more-users/248737>, 2010. [Online; published on 04.10.2010].
- [50] A. Lee, “Facebook Users DROP In U.S.: Millions Left The Social Network In May 2011.” http://www.huffingtonpost.com/2011/06/13/facebook-users-members-us-growth-drops-may-2011_n_875810.html, 2011. [Online; published on 13.06.2011].
- [51] J. Kiss, “Facebook UK loses 600,000 users in December.” <https://www.theguardian.com/technology/2013/jan/14/facebook-loses-uk-users-december>, 2013. [Online; published on 14.01.2013].
- [52] D. Saul, “3 Million Teens Leave Facebook In 3 Years: The 2014 Facebook Demographic Report.” <https://isl.co/2014/01/3-million-teens-leave-facebook-in-3-years-the-2014-facebook-demographic-report/>, 2014. [Online; published on 15.01.2014].
- [53] Wikidot, “Social Media Statistics.” <http://socialmediastatistics.wikidot.com/facebook>. [Online].
- [54] N. Burcher, “Facebook usage statistics by country - July 2010 compared to July 2009 and July 2008.” <http://www.nickburcher.com/2010/07/facebook-usage-statistics-by-country.html>, 2010. [Online; published on 02.07.2010].
- [55] eMarketer, “Emerging Markets Drive Facebook User Growth.” <https://www.emarketer.com/Article/Emerging-Markets-Drive-Facebook-User-Growth/1009875>, 2013. [Online; published on 09.05.2013].
- [56] SocialTimes, “Bonjour! Inside Facebook France Launches Today en Français.” <http://www.adweek.com/socialtimes/bonjour-inside-facebook-france-launches-today-en-francais/216052>, 2009. [Online; published on 04.01.2009].

- [57] L. Rao, “Facebook Now Has 149M Active Users In The U.S.; 70 Percent Log On Daily.” <https://techcrunch.com/2011/02/10/facebook-now-has-149m-active-users-in-the-u-s-70-percent-log-on-daily/>, 2011. [Online; published on 10.02.2011].
- [58] O. Yeates, “UK facebook statistics february 2012.” <https://www.clicky.co.uk/2012/02/uk-facebook-statistics-february-2012/>, 2012. [Online; published on 28.02.2012].
- [59] The Internet Coaching Library: Telecommunications Research Reports, “Internet World Stats: Usage and Population Statistics.” <http://www.internetworldstats.com/europa.htm>. [Online].
- [60] J. Constine, “Facebook’s Cutesy Annual Report To Partners Reveals First Country-By-Country Mobile Stats.” <https://techcrunch.com/2013/12/29/facebook-international-user-growth/>, 2013. [Online; published on 29.12.2013].
- [61] S. Mysore, “Facebook Growth Surges in Italy, Developers Look for Better Italian eCPMs.” <http://www.adweek.com/socialtimes/facebook-growth-surges-in-italy-developers-look-for-better-italian-ecpms/215697>, 2008. [Online; published on 18.12.2008].
- [62] L. Yung-Hui, “1 Billion Facebook Users On Earth: Are We There Yet?.” <http://www.forbes.com/sites/limyunghui/2012/09/30/1-billion-facebook-users-on-earth-are-we-there-yet/#751363872a0e>, 2012. [Online; published on 30.09.2012].
- [63] S. Mysore, “Facebook’s Footprint in Spain Up 600% in 2008.” <http://www.adweek.com/socialtimes/facebooks-footprint-in-spain-up-600-in-2008/215705>, 2008. [Online; published on 19.12.2008].
- [64] L. Parkinson, “How Tuenti Held Off Facebook in Spain with Better Privacy.” <http://mediashift.org/2011/03/how-tuenti-held-off-facebook-in-spain-with-better-privacy068/>, 2011. [Online; published on 09.03.2011].
- [65] LATEVAWEB, “How many people use Facebook in Spain.” <https://www.latevaweb.com/usodeffacebook-en.html>. [Online].
- [66] S. Mysore, “Facebook Germany Reaches More Than 1M Users, Gaining Ground on Competitor StudiVZ.” <http://www.adweek.com/socialtimes/facebook-germany-reaches-more-than-1m-users-gaining-ground-on-competitor-studivz/215540>, 2008. [Online; published on 18.12.2008].

- [67] Socialnomics, “Facebook and Germany to like or not to like.” <http://socialnomics.net/2013/04/24/facebook-and-germany-to-like-or-not-to-like/>, 2013. [Online; published on 24.04.2013].
- [68] Facebook, Inc., “Facebook annual report 2012.” <https://materials.proxyvote.com/Approved/30303M/20130409/AR.166822/document.pdf>, 2013. [Online].
- [69] Facebook, Inc., “Facebook annual report 2013.” <https://materials.proxyvote.com/Approved/30303M/20140324/AR.200747/pubData/source/Facebook%20AR%204-1-14.pdf>, 2014. [Online].
- [70] E. Flore, “5 Things You Can Learn From The Story Of WhatsApp.” <https://medium.com/the-story-of-grip/5-things-every-founder-can-learn-from-the-story-of-whatsapp-b6496bc4f54d#lk67xjuku>, 2015. [Online; published on 29.06.2015].
- [71] A. Satariano, “WhatsApp’s Founder Goes From Food Stamps to Billionaire.” <https://www.bloomberg.com/news/articles/2014-02-20/whatsapp-s-founder-goes-from-food-stamps-to-billionaire>, 2014. [Online; published on 20.02.2014].
- [72] T. Bradshaw, “WhatsApp users get the message.” <https://www.ft.com/content/30fd99a2-0c60-11e1-88c6-00144feabdc0#axzz3SqjQS5NT>, 2011. [Online; published on 14.11.2011].
- [73] N. Lomas, “Skype Competitor Viber Hits 175 Million Users, Up From 140 Million+ In December.” <https://techcrunch.com/2013/02/26/skype-competitor-viber-hits-175-million-users-up-from-140-million-in-december/>, 2013. [Online; published on 26.02.2013].
- [74] D. Rowan, “WhatsApp: The inside story.” <http://www.wired.co.uk/article/whatsapp-exclusive>, 2014. [Online; published on 19.02.2014].
- [75] Statista, “Annual revenue of WhatsApp from 2012 to 1st half 2014 (in million U.S. dollars).” <https://www.statista.com/statistics/346269/whatsapp-annual-revenue/>, 2014. [Online].
- [76] The World Bank, “World Development Indicators: Internet users (per 100 people).” <http://data.worldbank.org/indicator/IT.NET.USER.P2>. [last updated date: 01.07.2015].
- [77] The World Bank, “World Development Indicators: Total Population (in number of people).” <http://data.worldbank.org/indicator/SP.POP.TOTL>. [last updated date: 01.07.2015].

- [78] The World Bank, “World Development Indicators: GDP (current USD).” <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD>. [last updated date: 28.07.2015].
- [79] The World Bank, “World Development Indicators: Consumer price index (2010 = 100).” <http://data.worldbank.org/indicator/FP.CPI.TOTL>. [last updated date: 28.07.2015].